Mendel, Gregor. *Experiments in Plant Hybridisation.* Edited by **J. H. Bennett**, introduction by **R. A. Fisher.** Edinburgh, 1965. Oliver and Boyd. Pp. ix+95. Price 21s.

THE TITLE OF this book does not give a full idea of the delights it contains. As well as a reprint of Bateson's translation of Mendel's paper, together with an introduction by Fisher and Fisher's marginal comments, we have also Fisher's classic 1936 essay on the history of science "Has Mendel's work been rediscovered?", and Bateson's biographical notice of Mendel.

There would, in fact, be very little for a reviewer to say except recommend this book were it not for the intriguing nature of the question Fisher raised about Mendel's data. As is well known Mendel's data appear improbably close to expectation. In one part (the progeny tests of F_2 dominants to determine the proportion heterozygous) the data are in fact significantly deviant from Fisher's sophisticated expectations for the data fit a 2:1 ratio, but with the size of progeny grown, a proportion of the heterozygotes are not expected to be detected as such and should be scored as homozygotes, so that less than 2:1 should be observed.

It is, however, pertinent to ask in this centenary year whether Fisher proved his hypothesis that someone such as Mendel's gardener polished up the results. Fisherian expectations assume that binominal expansions of 1:1 or 3:1 give the correct expectations. However, pollen grains do not come at random but in tetrads, so that unless pollen grains are randomized we should expect ratios to be better than Fisherian. It still, therefore, remains an open question whether or no Mendel's results are really too good to be true.

This speculation does not detract from the interest of Fisher's paper, and the publication of all these papers together make a delightful little volume all schools and all biologists should wish to have, for together they provide an education not only in the origin of genetics but in the anatomy of experiment.

J. M. THODAY

Robinson, Roy. *The Genetics of the Norway Rat.* Oxford 1965. Pergamon. Pp. ix+804. Price £10.

WHEN, IN 1925, Morgan, Bridges and Sturtevant published *The Genetics of Drosophila*, genetics meant formal genetics and nothing else. In mammalian genetics, the purely formal aspects have always been less predominant, and *The Genetics of the Mouse* contains a good deal of material on the anatomical, embryological and physiological effects of single genes which the late Sir Ronald Fisher did not regard as genetics at all. Few people would now take so narrow a view of genetics, and the reviewer hopes that he will not be regarded as unduly restrictive in what he thinks mammalian genetics is about. For it seems to him that the title of this book *The Genetics of the Norway Rat* is seriously misleading. The rat has always been a poor relation of the mouse in that the number of individual genes which have been identified is small; so is the amount of work on the effects of individual genes, on mutation, spontaneous and induced, on linkage and so on. If all the work on the more traditional aspects of genetics in the rat was properly assessed and presented in a disciplined manner, it would not fill 200 pages. How, then, is it possible to write a genetics of the rat of four times that size, and costing £10? The rat has been used for a multitude of studies in many fields of biology and medicine, not to mention psychology. Increasingly in recent years, inbred strains have been used for such studies, and the comparison of strains inevitably yields inter-strain differences for any feature studied. From the genetical point of view, these are trivialities unless they yield critical information about the nature of the genetical structure which differentiates these strains, and this they have so far conspicuously failed to do. The book under review is largely composed of lengthy discourses on such inter-strain differences which make no contribution to genetics whatsoever. To call a book so largely consisting of that kind of material *The Genetics of the Norway Rat* is an appeal to the wrong category of purchasers (unless, of course, one relies on the libraries which have little choice in what they have to buy).

On the other hand, the book may well be useful to research workers other than geneticists who use the rat as an experimental animal. Sooner or later, they all come up against strain differences, and this book will help them to discover what is already on record. The author

has collected a vast amount of disparate material (52 pages of unclassified references) for which many people will be grateful to him. They would have been even more grateful if, by cutting out dead wood and a less discursive way of presentation, he had presented the material in half its present bulk. H. GRÜNEBERG

COLOUR BLINDNESS

Kalmus, H. *Diagnosis and Genetics of Defective Colour Vision.* Oxford, 1965. Pergamon. Pp. x+114. Price 50s.

THIS IS AN authoritative work on the detection and differentiation of types of colour blindness and their inheritance. It opens with a brief history of the discovery of colour vision defects, which is believed to have started with Plato. Details of the history of the subject have been published several times before, but it is useful for this book to open with Dr. Kalmus's account of them. Then he proceeds to a very clear statement of the essentials of colour theory based on the trichromatic system. He considers that those aspects of colour vision and colour blindness which accord with Hering's four-colour theory or modifications of it do not arise at the receptor level.

The next chapters deal with subjective aspects of defective colour vision, types of defect and their compounds and interactions. Dr. Kalmus accepts three degrees of protan defect (protanopia, extreme protanomaly and protanomaly), and of deutan defect (deuteranopia, extreme deuteranomaly and deuteranomaly), but he thinks, as the reviewer does, that there must be mord than three abnormal genes in each group. It is interesting to have his notes on cone and rod monochromats, night blindness and tritan defects. He gives useful tables of the possible frequencies of female gene combinations for the one and two locus theories.

The chapters on the detection of colour blindness are likely to be of considerable interest to field workers and others engaged in research and practical problems of colour blindness in industry and elsewhere. Dr. Kalmus mentions verbal tests, description of the spectrum, lantern tests, the observation of Maxwell's spot and pseudo-isochromatic tests in Chapter VI. Anomaloscopes are discussed in the next chapter, together with Farnsworth's 100-Hue and Dichotomous Tests.

The reviewer still considers that it is unsatisfactory to base anomaloscope testing on the principles (*a*) that the subject of the test himself manipulates the controls, and (*b*) that he makes settings of the red-green mixture to match various brightnesses of the yellow taken more or less at random. The essential measurements to be made are the two limits of the matching range. To do this the yellow must first be matched in brightness with the red-green mixture when a colour difference is apparent, and then taken right through the matching range until the appearance of the other colour difference, several times each way, step by step, always equating brightness before a report of colour equality is accepted. The mid-point is the middle of the matching range, whether it is small or large. For dichromats the matching range extends to the ends of the scale and the concept of the mid-point becomes arbitrary.

The reviewer and others have described extensively the use of the anomaloscope in this way, and, if this technique were adopted, many difficulties and discontents would be overcome. We should not continue to feel, as Dr. Kalmus does, like many others, that the anomaloscope is unsatisfactory and must be supplemented by pseudo-isochromatic tests. The same applies to other anomaloscope tests, such as the yellow-blue and blue-green equations.

The remainder of the book deals with the hypothetical pathology of colour vision defects and the problems of the genetics of sex-linked defects in which there are two loci (protan and deutan) and allelic genes at each locus having their characteristic dominance orders, which are normal (most dominant), protanomalous, extreme protanomalous and protanopic, at the one locus, and normal (most dominant) deuteranomalous, extreme deuteranomalous and deuteranopic at the other. Dr. Kalmus introduces a set of gene symbols which will be useful, but he does not mention that of Walls and Mathews (1952) or of the reviewer (1951).

The varying frequency of defective colour vision in different human groups is considered,